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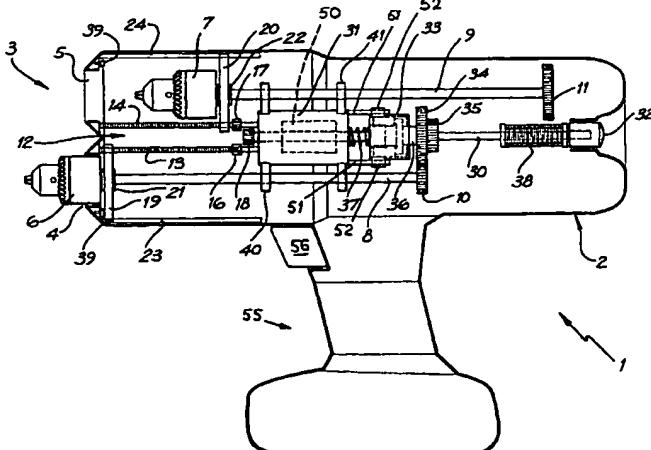
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(54) Title: IMPROVED TWIN CHUCK DRILL



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(57) Abstract: A pistol grip casing (2) contains the two chucks (6 & 7) which are selectively positionable at their positions of use in front of the casing. A drive motor (31) is selectively connectable to the chuck at its position of use by the engagement of pinions (34 & 35) with whichever of the pinions (10 & 11) is mounted on the respective drive shafts (8 & 9) of the chuck at the position of use. Selection of the chuck (6 & 7) to be at the position of use is achieved by depressing a button (32) at the back of the casing (2) to move a drive shaft (30) of the motor (31) forward so that the pinions (34, 35, 10 & 11) disengage and a cog (18) at the other end of the motor drive shaft (30) engages the two cogs (16, 17) for rotating two parallel leadscrews (13, 14). Simultaneous rotation of the leadscrews (13, 14) causes the chucks (6 & 7) to be interchanged at the front of the casing (2). A solenoid (38) holds the button (32) depressed until sensors (39) detect the presence of the new chuck at its forward position in front of the casing (2).

IMPROVED TWIN CHUCK DRILLField of the Invention:

THIS INVENTION relates to a drill and is more specifically concerned with a portable pistol-grip drill.

5 State of the Art:

Pistol-grip drills are commonly pneumatically or electrically operated and have the advantage that they can be operated by using one hand. However their size and weight are limited by this requirement, and so is their power. If a large drill hole has to be formed the drill user will usually resort to a two-stage operation. First a pilot drill hole 10 will be made and then the required drill will be replaced in the drill chuck by a thicker drill which will follow the pilot hole and enlarge it to the required size.

Replacing a pilot drill with a drill of larger size can be a nuisance, particularly when the user of the drill is standing on a ladder or using the drill in an overhead or otherwise awkward position. Attempts have been made to overcome this problem by providing a 15 drill with two chucks which can be loaded respectively with the two drills required to form the desired drill hole. These two chucks may be provided at opposite ends of the drill on a drill head which can be bodily rotated about an upright axis to bring one or other of the two drills selectively to the drilling position. A drill having a rotatable drill head is a rather cumbersome item of equipment to use, and this has mitigated against its 20 widespread use.

Object of the Invention:

An object of this invention is to provide an improved two-chuck drill.

The Invention:

In accordance with the present invention a portable, pistol-grip drill has a casing 25 provided at its front end with two openings, a drive motor inside the casing and operated from the pistol-grip, two drill chucks selectively projectable through the respective openings to positions of use in front of the drill casing, a first mechanism operable to advance a selected chuck to its position of use and to retract the other chuck

inside the casing, a second mechanism for imparting rotational drive from the motor to the chuck in its position of use, first means for driving each of the two mechanisms from the drive motor, and, second means for selecting which of the chucks is to be present at its position use in front of the drill casing for enabling the drill-user to choose
5 which of the mechanisms is to be operated.

Advantages of the Invention:

The advantage of the invention is that it provides the user with the option of using two drills selectively at the front end of the drill without having to rotate a drill head or reload a drill chuck. Problems associated with providing a rotatable drill head are thus
10 avoided.

Preferred features of the Invention:

Conveniently the two chucks are each provided with a separate parallel drive shaft and the two drive shafts are respectively reciprocated in unison but in opposite directions by the first mechanism. This may be achieved by giving each chuck drive shaft a parallel
15 leadscrew to control its position. The first mechanism suitable operates to produce a simultaneous rotation of the two leadscrews so that one retracts the associated drill chuck while the other advances its associated drill chuck towards its position of use in front of the drill. A sensor inside the front of the drill casing may be used to detect when the advancing drill chuck has reached its position of use and to then allow power
20 from the drive motor to be applied to the shaft of the chuck projecting from the casing. Preferably the drive shafts of the chucks are not operable during operation of the first mechanism.

In a preferred arrangement of the invention the drive motor is fixed in position inside the casing and has an associated epicyclic planetary gear box which is mounted on an
25 output drive shaft of the motor. Such mounting is carried out in a way that allows the motor drive shaft to be reciprocated axially of its length in the casing and through the centre of the fixed drive motor. Such reciprocation maybe effected by a manual operation of the selector which conveniently takes the form of a manually-operated button on the rear of the drill casing .. A device outside the casing

which, when operated, isolates the motor output drive from the chuck drive shafts by de-activation the second mechanism, and connect the output from the motor to operate the first mechanism. The rotational drive to the chucks then ceases and they can be safely interchanged at the front of the casing. This enables a larger drill carried by one
5 chuck, to be brought to the front of the casing while the second chuck carrying a pilot drill of smaller diameter, is retracted into the casing.

In the Drawing:

The invention will now be described in more detail, by way of example, with reference to the accompanying drawing which shows a diagrammatic side view, partly in section,
10 of a portable, electric, pistol-grip hand drill.

Description of Illustrated Preferred Embodiment:

The pistol-grip drill illustrated at 1 has a casing 2 provided at its front end 3 with two openings 4 and 5. Associated with respective openings are drill chucks 6 and 7 each mounted on one end of its own drive shaft 8 and 9 and having a gear 10 and 11 at its
15 other end. The gear 11 is larger in diameter than the gear 10. The two chuck drive shafts 8 and 9 extend parallel to one another and can be reciprocated, together with their associated chucks, the casing 2 is provided with a pistol-grip 55 having a power-operating trigger 56 by operation of a first mechanism shown generally at 12 and located towards the forward end of the interior of the casing 2. The mechanism 12
20 comprises two parallel leadscrews 13 and 14 which are positionally fixed while being capable of being rotated about their longitudinal axes when their respective cogs 16 and 17 are engaged with a drive cog 18 located between their axes, as shown. The leadscrews 13 and 14 pass through threaded openings in respective slide bars 19 and 20. These are guided for movement along the axes of the leadscrews in opposite directions
25 respectively, by having central slide bushes 21 and 22 through which pass the respective chuck drive shafts 8 and 9. The ends of the slide bars 19 and 20 remote from the leadscrews 13 and 14 are guided for sliding movement along respective rails 23 and 24 fixed inside the casing 2.

The drive cog 18 is fixed to the forward end of a motor drive shaft 30 having its forward portion of larger cross-section than its rearward portion and which is splined in a 5
slidable manner through a rotor 50 of a motor 31 fixed to the casing. The drive shaft 30 has a button 32 at its rear end which protrudes from the back of the casing. The button 32 does not participate in the rotation of the shaft 30 but can be depressed to control its axial position. An electromagnet 38 retains the button 38 in its depressed position until one of two sensing switches or sensors 39 at the forward end of the casing detects one of the chucks 6 and 7 being present at its position of use in front of the casing 2.

The second of the motor drive shaft 30 between the motor 31 and the button 32 has 10 attached to it a planetary gearbox 33 which is fixed to the drive shaft 30 so as to participate in its axial movement, and has a pair of differently-sized and axially-spaced pinions 34 and 35 fixed to its output shaft 36. Guide spindles 51 projecting in parallel rearwardly from the motor 31 pass through lugs 52 on the gearbox 33 to guide its movement. A compression spring 37 is located between the opposed ends of the motor 15 31 and the planetary gearbox 33 and biases the shaft 30 and the planetary gearbox 33 resiliently towards the rear of the casing 2.

Slide bushes 40 and 41 attached to the motor 31 guide movement as the drive shafts 8 and 9 to ensure that they slide parallel to one another.

Operation of the Preferred Embodiment:

20 The drill illustrated operates as follows:

A drill bit of the required diameter to make a hole of the desired size is loaded in the chuck 7. The button 32 at the back of the casing 2 is ~~pressed and held electromagnetically to~~ slide the drive shaft 30 forwardly through the fixed drive motor 31 so that the cog 18 at its forward end engages with both of the cogs 16 and 17. The planetary gearbox gear 33 25 participates in the forward movement of the shaft 30 as the coil spring 37 is readily compressed.

The drill operator then squeezes the power-operating trigger 56 on the drill pistol-grip 55. The motor 31 rotates the drive shaft 30 and thus the cog 18 engages between the

two cogs 16 and 17. These rotate their associated leadscrews 13 and 14. The bars 19 and 20 then travel in opposite directions so that the drill bit together with its chuck 6 is withdrawn into the casing 2 and the other chuck 7 simultaneously travels forwards to its operating position when it projects from the front of the casing 2. The trigger 56 is then
5 released. The second chuck 7 can then be loaded with a smaller diameter drill bit which is to form the pilot hole.

The button 32 is held in its depressed position by the electro-magnet 38 inside the casing, even after the manual pressure on it has been released, until one or other of the chucks 6, 7 is at its position of use. This results from the fact that the switch 39
10 associated with the bar 20, de-energises the electric circuit to the electro-magnet 38 only when one of the chucks is in its position of use in front of the drill. Until this occurs, the planetary gearbox gear 33 remains in its forward position close to the rear side of the drive motor 31 and the two pinions 34 and 35 associated with the planetary gearbox 33 are then held in positions at which they cannot be engaged by the gears 10 and 11.
15 When the electro-magnet 38 is de-energised, the compression spring 37 biases the planetary gearbox 33 back to its reward position shown in the drawing. The power trigger 56 on the pistol grip is then released, allowing the pinion 35 to engage the gear 11 which is then in its forward position. This also allows the cog 18 to disengage from between the two cogs 16 and 17. When the power trigger 56 is again depressed, the drive from the motor 31 is applied only to the drill chuck 7 which is now projecting
20 from the front of the drill and has its pinion 11 in mesh with the gear 35.

When the pilot hole has been made, the operator releases the power trigger 56 and presses the button 32 at the rear of the casing 2. The mechanism 12 then operates when the power trigger 56 is again depressed, to retract the required drill bit back into the casing 2 and advance the other drill bit to its position of use in front of the drill so that the pilot hole can be enlarged. The electro-magnet 38 is then de-energised by the sensor 39 so that the planetary gear box 33 assumes the position illustrated. The drill is then again ready for use so that the required drill hole can be enlarged when the power trigger 56 is again depressed.
25

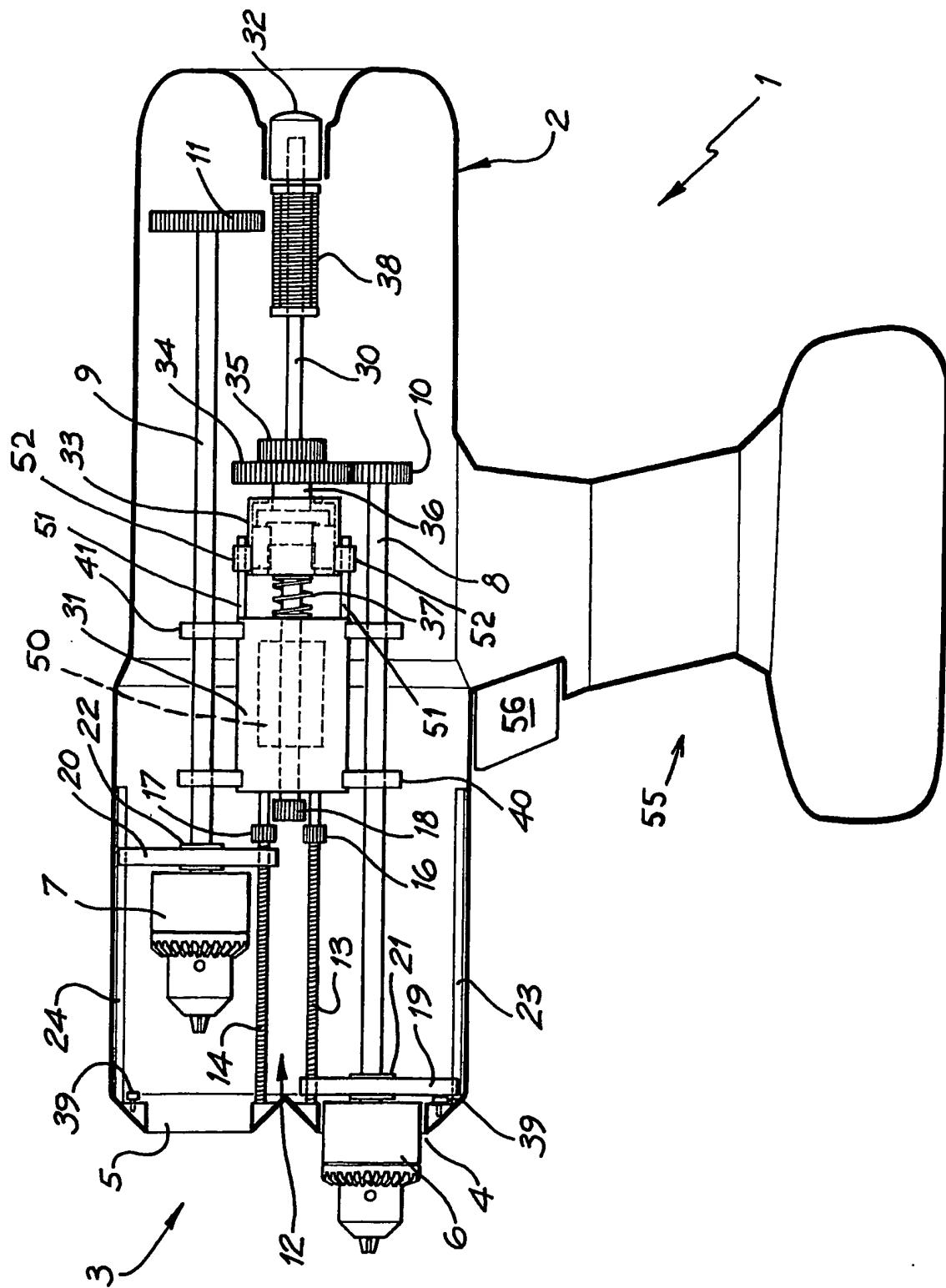
Drilling dust can be prevented from entering the openings into the front of the casing from which one of the chucks has been retracted by providing a fan impeller (not shown) inside the casing which is driven by the motor drive shaft 30 and provides a strong stream of air drawn into the casing from small apertures in its rear, the air stream 5 blowing through the front of the casing so that it discharges forwardly through the opening associated with the retracted chuck.

Claims:

1. A portable, pistol-grip drill having a casing provided at its front end with two openings, a drive motor inside the casing and operated from the pistol-grip, two drill chucks selectively projectable through the respective openings to positions of use in front of the drill, a first mechanism operable to advance a selected chuck to its position of use and to retract the other chuck inside the casing, a second mechanism for imparting rotational drive from the motor to the chuck in its position of use, first means for driving each of the two mechanisms from the motor, and second means for selecting which of the chucks is to be present at its position of use in front of the drill casing.
- 10 2. A drill as set forth in claim 1, in which the drive motor is fixed in position inside the casing and the second means which takes the form of a member manually-operable from outside the casing and which activates said first means to disconnect one of the mechanisms and connect the other mechanism to be driven by the motor.
- 15 3. A drill as set forth in claim 2, in which the member is an axially-reciprocable drive shaft extending in a slidable manner through the motor and activates said first means to transmit the motor drive to which ever of the two mechanisms is selected for operation.
- 20 4. A drill as set forth in claim 3, in which the drive shaft carries at one end a cog which, in one axial position of the drive shaft, engages with cogs of two leadscrews extending parallel to the drive shaft and rotatable to respectively retract one of the chucks into the casing while simultaneously advancing the other chuck to its position of use in front of the casing, the drive shaft carrying at its other end gearing which selectively engages gears on respective chuck-drive shafts so that in the displaced second axial position of the drive shaft whichever of the chucks is projecting from the forward end of the casing is selectively drivable by the motor drive shaft.
- 25 5. A drill as set forth in any one of the above claims in which sensing means detects whichever of the chucks has reached its forward position of use in front of the

casing and responds by disconnecting the motor drive applied to the first mechanism and applies it instead to the second mechanism.

6. A drill as set forth in claim 5, in which energisation of an electromagnet controlled by the sensing means prevents the drive being transferred to the second mechanism until the first mechanism has finished operating.
5



INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU2004/000330

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. 7: B23B 45/02, B25B 21/00, B25F 3/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPAT (IPC marks: B23B 45/02, B25B 21/00, B25F 3/00 and keywords: double, twin, chuck, head and like terms)**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|-----------------------|
| A | EP 673723 A (BLACK & DECKER) 27 September 1995 Abstract | 1 - 6 |
| A | GB 2343646 A (MICHAEL BURVILL) 17 May 2000 Abstract | 1 - 6 |
| A | WO 2002/026453 A (ERIKSEN) 4 April 2002 Abstract | 1 - 6 |
| A | WO 2001/017728 A (CUMMINS) 15 March 2001 Abstract | 1 - 6 |

Further documents are listed in the continuation of Box C

See patent family annex

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/AU2004/000330

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

| Patent Document Cited in Search Report | | | | Patent Family Member | | | |
|---|---------|----|----------|----------------------|---------|----|------------|
| EP | 0673723 | AU | 15047/95 | CA | 2145116 | CN | 1125651 |
| GB | 2343646 | AU | 10665/00 | WO | 0029173 | | |
| WO | 0226453 | AU | 91642/01 | EP | 1333965 | US | 2003165365 |
| WO | 0117728 | AU | 42016/00 | US | 6506002 | | |

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX